4600 = average non-heating season hours per year

K = 0.001 kWh/Wh, conversion factor for watt-hours to kilowatt-hours

BOH = burner operating hours as calculated in section 4.6.1 of this appendix where for single-stage controls or manual controls vented heaters BOH = BOH$_{SS}$ and for vented heaters equipped with two-stage or modulating controls BOH = (BOH$_R$ + BOH$_H$).

[49 FR 12169, Mar. 28, 1984, as amended at 62 FR 26162, May 12, 1997; 77 FR 74571, Dec. 17, 2012]

APPENDIX P TO SUBPART B OF PART 430—UNIFORM TEST METHOD FOR MEASURING THE ENERGY CONSUMPTION OF POOL HEATERS

NOTE: The procedures and calculations that refer to standby mode and off mode energy consumption (*i.e.*, sections 2.2, 2.3, 3.2, 4.2, 4.3, 5.3 equation (3), and 5.4 of this appendix P) need not be performed to determine compliance with energy conservation standards for pool heaters at this time. However, on or after June 17, 2013, any representations related to standby mode and off mode energy consumption of these products must be based upon results generated under this test procedure, consistent with the requirements of 42 U.S.C. 6293(c)(2). For pool heaters, the statute requires that after July 1, 2010, any adopted energy conservation standard shall incorporate standby mode and off mode energy consumption, and upon the compliance date for such standards, compliance with the applicable provisions of this test procedure will also be required.

1. *Definitions.*

1.1 *Active mode* means the condition during the pool heating season in which the pool heater is connected to the power source, and the main burner, electric resistance element, or heat pump is activated to heat pool water.

1.2 *IEC 62301* (Second Edition) means the test standard published by the International Electrotechnical Commission, titled ''Household electrical appliances—Measurement of standby power,'' Publication 62301, Edition 2.0 2011–01. (incorporated by reference; see §430.3)

1.3 *Off mode* means the condition during the pool non-heating season in which the pool heater is connected to the power source, and neither the main burner, electric resistance elements, nor heat pump is activated.

1.4 *Seasonal off switch* means a switch present on the pool heater that effects a difference in off mode energy consumption as compared to standby mode energy consumption.

1.5 *Standby mode* means the condition during the pool heating season in which the pool heater is connected to the power source, and

neither the main burner, electric resistance elements, nor heat pump is activated.

2. *Test Method.*

2.1 *Active mode.* The test method for testing pool heaters in active mode is as specified in section 2.10 of ANSI Z21.56 (incorporated by reference; see §430.3).

2.2 *Standby mode.* The test method for testing the energy consumption of pool heaters in standby mode is as described in sections 3 through 5 of this appendix.

2.3 *Off mode.*

2.3.1 *Pool heaters with a seasonal off switch.* For pool heaters with a seasonal off switch, no off-mode test is required.

2.3.2 *Pool heaters without a seasonal off switch.*

For pool heaters without a seasonal off switch, the test method for testing the energy consumption of the pool heater is as described in sections 3 through 5 of this appendix.

3. *Test conditions.*

3.1 *Active mode.* Establish the test conditions specified in section 2.10 of ANSI Z21.56 (incorporated by reference; see §430.3).

3.2 *Standby mode and off mode.* Following the conclusion of the 30-minute active mode test described in section 2.10 of ANSI Z21.56 (incorporated by reference; see §430.3), reduce the thermostat setting to a low enough temperature to put the pool heater into standby mode. Operate the pool heater in standby mode for 60 minutes.

4. *Measurements.*

4.1 *Active mode.* Measure the quantities delineated in section 2.10 of ANSI Z21.56 (incorporated by reference; see §430.3). The measurement of energy consumption for oil-fired pool heaters in Btu is to be carried out in appropriate units (*e.g.*, gallons).

4.2 *Standby mode.* Record the average electric power consumption during the standby mode test, $P_{W,SB}$, in W, in accordance with section 5 of IEC 62301 (Second Edition) (incorporated by reference; see §430.3) and the fossil fuel energy consumption during the standby test, Q_p, in Btu. Ambient temperature and voltage specifications of ANSI Z21.56 (incorporated by reference; see §430.3) shall apply to this standby mode testing. The recorded standby power ($P_{W,SB}$) shall be rounded to the second decimal place, and for loads greater than or equal to 10W, at least three significant figures shall be reported.

4.3 *Off mode.*

4.3.1 *Pool heaters with a seasonal off switch.* For pool heaters with a seasonal off switch, the average electric power consumption during the off mode, $P_{W,OFF}$ = 0, and the fossil fuel energy consumed during the off mode, Q_{off} = 0.

4.3.2 *Pool heaters without a seasonal off switch.* Record the average electric power consumption during the standby/off mode test, $P_{W,OFF}$ (= $P_{W,SB}$), in W, in accordance with section 5 of IEC 62301 (Second Edition)

(incorporated by reference; see §430.3), and the fossil fuel energy consumption during the off mode test, Q_{off} (= Q_p), in Btu. Ambient temperature and voltage specifications of ANSI Z21.56 (incorporated by reference; see §430.3) shall apply to this off mode testing. The recorded off mode power ($P_{W,OFF}$) shall be rounded to the second decimal place, and for loads greater than or equal to 10W, at least three significant figures shall be reported.

5. *Calculations.*

5.1 *Thermal efficiency.* Calculate the thermal efficiency, E_t (expressed as a percent), as specified in section 2.10 of ANSI Z21.56 (incorporated by reference; see §430.3). The expression of fuel consumption for oil-fired pool heaters shall be in Btu.

5.2 *Average annual fossil fuel energy for pool heaters.* The average annual fuel energy for pool heaters, E_F, is defined as:

E_F = BOH Q_{IN} + (POH − BOH)Q_{PR} + (8760 − POH) $Q_{off,R}$

Where:

BOH = average number of burner operating hours = 104 h

POH = average number of pool operating hours = 4464 h

Q_{IN} = rated fuel energy input as defined according to section 2.10.1 or section 2.10.2 of ANSI Z21.56, as appropriate.

Q_{PR} = average energy consumption rate of continuously operating pilot light, if employed, = (Q_P/1 h)

Q_P = energy consumption of continuously operating pilot light, if employed, as measured in section 4.2 of this appendix, in Btu

8760 = number of hours in one year

$Q_{off,R}$ = average off mode fossil fuel energy consumption rate = Q_{off}/(1 h)

Q_{off} = off mode energy consumption as defined in section 4.3 of this appendix

5.3 *Average annual auxiliary electrical energy consumption for pool heaters.* The average annual auxiliary electrical energy consumption for pool heaters, E_{AE}, is expressed in Btu and defined as:

(1) E_{AE} = $E_{AE,active}$ + $E_{AE,standby,off}$
(2) $E_{AE,active}$ = BOH * PE
(3) $E_{AE,standby,off}$ = (POH − BOH) $P_{W,SB}$(Btu/h) + (8760 − POH) $P_{W,OFF}$(Btu/h)

Where:

$E_{AE,active}$ = auxiliary electrical consumption in the active mode

$E_{AE,standby,off}$ = auxiliary electrical consumption in the standby mode and off mode

PE = $2E_c$, if heater is tested according to section 2.10.1 of ANSI Z21.56, in Btu/h = 3.412 PE_{rated}, if heater is tested according to section 2.10.2 of ANSI Z21.56, in Btu/h

E_c = electrical consumption of the heater (converted to equivalent unit of Btu), including the electrical energy to the recirculating pump if used, during the 30-minute thermal efficiency test, as de-

fined in section 2.10.1 of ANSI Z21.56, in Btu per 30 min.

2 = conversion factor to convert unit from per 30 min. to per h.

PE_{rated} = nameplate rating of auxiliary electrical equipment of heater, in Watts

BOH = as defined in 5.2 of this appendix

POH = as defined in 5.2 of this appendix

$P_{W,SB}$ (Btu/h) = electrical energy consumption rate during standby mode expressed in Btu/h = 3.412 $P_{W,SB}$, Btu/h

$P_{W,SB}$ = as defined in 4.2 of this appendix

$P_{W,OFF}$ (Btu/h) = electrical energy consumption rate during off mode expressed in Btu/h = 3.412 $P_{W,OFF}$, Btu/h

$P_{W,OFF}$ = as defined in 4.3 of this appendix

5.4 Integrated thermal efficiency.

5.4.1 Calculate the seasonal useful output of the pool heater as:

E_{OUT} = BOH[(E_t/100)(Q_{IN} + PE)]

Where:

BOH = as defined in 5.2 of this appendix

E_t = thermal efficiency as defined in 5.1 of this appendix

Q_{IN} = as defined in 5.2 of this appendix

PE = as defined in 5.3 of this appendix

100 = conversion factor, from percent to fraction

5.4.2 Calculate the annual input to the pool heater as:

E_{IN} = E_F + E_{AE}

Where:

E_F = as defined in 5.2 of this appendix

E_{AE} = as defined in 5.3 of this appendix

5.4.3 Calculate the pool heater integrated thermal efficiency (TE$_I$) (in percent).

TE$_I$ = 100(E_{OUT}/E_{IN})

Where:

E_{OUT} = as defined in 5.4.1 of this appendix

E_{IN} = as defined in 5.4.2 of this appendix

100 = conversion factor, from fraction to percent

[77 FR 74572, Dec. 17, 2012]

APPENDIX Q TO SUBPART B OF PART 430—UNIFORM TEST METHOD FOR MEASURING THE ENERGY CONSUMPTION OF FLUORESCENT LAMP BALLASTS

Comply with Appendix Q until November 14, 2014. After this date, all fluorescent lamp ballasts shall be tested using the provisions of Appendix Q1.

1. Definitions

1.1 *AC control signal* means an alternating current (AC) signal that is supplied to the ballast using additional wiring for the purpose of controlling the ballast and putting the ballast in standby mode.